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EXAMINER	
ROSARIO-VASQUEZ, DENNIS	
ART UNIT	**PAPER NUMBER**
2621	6

DATE MAILED: 03/24/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/881,384	DESHPANDE, SACHIN G.	
	Examiner	Art Unit	
	Dennis Rosario-Vasquez	2621	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 June 2001*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-40* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-11,13,14,16-18 and 21-40* is/are rejected.

7)☒ Claim(s) *12,15,19 and 20* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *12 June 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *4,5*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1-4,6-11,13,14 and 21-28, 30-33 and 35-40 are rejected under 35 U.S.C. 102(b) as being anticipated by Lee (US Patent 6,226,050 B1).

Regarding claim 1, Lee discloses a filter system (fig. 1) for post-processing a digital image (fig. 1,"INPUT IMAGE DATA"), said digital image having a plurality of visual-edge pixels or "edge area" and a plurality of visual non-edge pixels or "homogeneous area" at col. 2, lines 30-33, said filter system comprising:

(a) an edge mapper (fig. 1, num. 120:"BINARY EDGE MAP GENERATOR") for producing a binary map of said visual edge pixels and said visual non-edge pixels;

(b) a pixel sorter (fig. 1, num. 130:"FILTER SELECTOR") comprising;

(i) said pixel sorter for reading said binary map (The output of the binary edge map generator is used as input for the filter selector 130); and

(ii) said pixel sorter for assigning to each pixel a type of filtration to be provided by said filter system (The output of the filter selector 130 outputs data to either an average filter or a weighted filter based upon an edge area or a homogeneous area at col. 4, lines 1-5.);

(c) an adaptive filter (fig. 1, num. 140 and 150) for receiving output from said pixel sorter; and

(d) said adaptive filter comprising:

(i) a de-ringing module (The system of figure 1 eliminates ringing at abstract lines 23,25, col. 1, lines 36-40 and col. 5, lines 34-37) for post-processing ("decompressed image data, including ringing noise" at col. 3, lines 4,5) said visual non-edge pixels; and

(ii) an edge sharpener (fig. 1, num. 150 filters edges with weights at col. 4, lines 52-65) for post-processing said edge pixels.

Regarding claim 2 Lee discloses the filter system of claim 1, said edge mapper further comprising:

(a) an edge detector (fig. 1, num. 110:"GRADIENT OPERATION UNIT" is coupled to the input of the edge mapper or binary edge map generator of fig. 1, num. 120.) comprising:

(i) said edge detector for calculating intensity gradients for each pixel in said digital image "one-dimensional gradient operation" at col. 3, lines 8-12. ;

(ii) said edge detector for assigning a first edge value to each edge pixel based on said intensity gradients ("absolute value of the gradient-operated result" at col. 3, lines 20,21); and

(iii) said edge detector for assigning a second edge value "absolute value [of an adjacent pixel]" to each non-edge pixel based on said intensity gradients (A comparison is made to determine whether an absolute value should be assigned an edge value or non-edge value at col. 3, lines 48-51). ;

and

(b) a memory storage array (fig. 1, num. 130:The filter selector stores the binary map information which originated in the gradient operation unit at col. 3, lines 62,63) for storing said first edge value for each edge pixel and for storing said second edge value for each non-edge pixel.

Claims 3 and 4 are standard edge detection methods; therefore, official notice is implemented.

Regarding claim 6, Lee discloses the filter system of claim 2, said pixel sorter further comprising:

(a) a first comparator (fig. 5, num. 520 or fig. 1, num. 120:"BINARY EDGE MAP GENERATOR", which is coupled to the pixel sorter or filter selector of figure 1, num. 130) for sorting said visual edge pixels from said visual non-edge pixels (Figure 1, num. 120 has a threshold process or comparator that determines an edge pixel at col. 3, lines 48-51.).;

(b) a selector (fig. 1, num. 130:"FILTER SELECTOR" or fig. 5, num. 525 and 535 are processes within the filter selector) comprising:

(i) said selector receiving output from said first comparator (The output of numeral 520 of figure 5 or fig. 5, num. 120 is used as an input to the selector of figure 1, num. 130 or fig. 5, numeral 525.);

and

(ii) said selector designating a kernel of pixels near each pixel being processed (Selector or filter selector uses edge information within a 3 X 3 window at col. 4, lines 1-4) ; and

(c) a second comparator comprising:

(i) said second comparator (fig. 5, num. 535: The second comparator is located within the above filter selector of figure 1, num. 130) receiving output (Figure 5, num. 525's output is used as an input to figure 5, num. 535 or second comparator) from said selector;

and

(ii) said second comparator (Fig. 5, num. 535 or the second comparator determines whether or not a central pixel value is an edge pixel for later filtering) assigning types of filtration to each pixel being processed based at least in part on a sum of first edge values and second edge values of said pixels in said kernel of pixels (Previously an absolute value was determined between pixels during the generation of the binary edge map which is used by Fig. 5, num 535 or second comparator to locate edge and non-edge areas at col. 4, lines 1-5.).

Regarding claim 7, Lee discloses the filter system of claim 6, wherein said kernel of pixels is a grid of pixels in which said pixel being processed is a center pixel in said grid of pixels (Lee uses an average filter and a weighted filter with a center pixel as shown in figure 4).

Regarding claim 8, Lee discloses the filter system of claim 6, wherein said second comparator (fig. 1, num. 130 or fig. 5, num. 535) is for applying de-ringing filtration by said de-ringing module (Fig. 1) to said pixel being processed if said pixel being processed is a visual non-edge pixel (The output of numeral 535 to 545 is non-edge information) and said sum of first edge values and second edge values of said pixels in said kernel of pixels is less than a predetermined threshold value defining a true visual edge (The sum or absolute value was used previously during the generation of the binary map to be compared with a threshold that determines edge pixels at col. 3, lines 48-51).

Regarding claim 9, Lee discloses the filter system of claim 6, wherein said first comparator is for applying edge sharpening filtration by said edge sharpener to said pixel being processed if said pixel being processed is a visual edge pixel. Lee states," If the filtering area is determined to be an edge area, the filter selector 130 outputs the binary edge map information [from fig. 1, num. 120 or first comparator] of the filter window used for the decision and position data of the central pixel in the filter window to the weighted filter 150 or edge sharpener (col. 4, lines 13-17)."

Claim 10 is similar to and addressed in claims 8 and 32.

Regarding claim 11, Lee discloses the filter system of claim 6, said filter system further comprising:

(a) a grayscaler (fig.1, num. 150);

(b) said grayscaler for summing grayscale values of all visual edge pixels in said kernel of pixels (For fig. 1, num. 150, Lee sums all weighted values ("weighted values are summed" at col. 5, line 8) of the kernel of fig. 1, num. 150 that include edge pixels and non-edge pixels based on the position of the edge and non-edge pixels from col. 4, line 52 to col. 5, line 8. The sum of all pixels within the kernel are used to alter the central and surrounding pixels of the kernel at col. 5, lines 9-26.) ; and

(c) said grayscaler summing grayscale values of all visual non-edge pixels in said kernel of pixels (addressed above).

Regarding claim 13, Lee discloses the filter system of claim 1, said de-ringing module further comprising a weighting module (fig. 1 as a whole is the de-ringing module, num. 150: WEIGHTED FILTER); said weighting module altering a grayscale value of each visual non-edge pixel (addressed in claim 11) for final display in direct proportion (Using figure 1, the output of numerals 140:"AVERAGE FILTER" and numeral 150:"WEIGHTED FILTER" are directly combined together to "OUTPUT IMAGE DATA"). to an average grayscale value of all visual non-edge pixels in a kernel of pixels (Note as shown in figure 1 that the average greyscale value is from the average filter 140 is outputted directly with the output of the weighted filter 150.).

Regarding claim 14, Lee discloses the filter system of claim 13, said average grayscale value further comprising:

(a) a sum of grayscale values from said all visual non-edge pixels in said kernel of pixels;

(b) said sum divided by a number of said all visual non-edge pixels in a kernel of pixels.

Lee implicity uses these elements for the average filter of figure 1, num 140, which filter non-edge pixes, because the elements of claim 14 describe taking an average as implied by Lee's average filter which implicitly takes a sum of values and divides by the number of values.

Regarding claim 21, Lee discloses the filter system of claim 1, said edge sharpener further comprising a limiter for decreasing said edge sharpening to avoid saturation of visual edges (Lee states," If the central pixel of index "5" is an edge pixel, the weighted filter 150 does not perform the filtering operation on the central pixel (col. 4, lines 55-57).").

Regarding claim 22, Lee discloses the filter system of claim 1, said filter system sharing data and calculations between said edge mapper, said pixel sorter, and said adaptive filter to reduce calculations (Lee solves a floating point problem by changing the filter coefficients of the filter of fig.1, num. 150 from col. 4, line 66 to col. 5, lines 1-8.

Regarding claim 23, Lee discloses all the elements of claim 23 as discussed in claim 1, and additionally discloses displaying said edge pixels after edge sharpening and said non-edge pixels after de-ringing (Lee implicitly uses an output terminal of figure 1 that displays an "enhanced" image which was displayed previously with ringing at col. 1, lines 30-32 and col. 5, line 37).

Claim 24 was addressed in claim 2.

Regarding claim 25, Lee discloses the method of claim 23, said step of sorting pixels of said edge map further comprising the step of sorting each non-edge pixel according to a number of edge pixels in a kernel of pixels surrounding said non-edge pixel. The filter selector of figure 1, num 130 determines whether a central pixel is an edge pixel within a 3 X 3 window at col. 4, lines17-20. Therefore a non-edge pixel is determined from the neighboring 8 pixels of the 3 X 3 window.

Claim 26 is similar to and addressed in claim 32.

Regarding claim 27, Lee discloses the method of claim 23, said step of de-ringing said non-edge pixels further comprising the steps of:

(a) averaging (fig. 1, num. 140:"AVERAGE FILTER") grayscale values of pixels ("decompressed image data" at col. 3, lines 4,5) in said kernel of pixels surrounding each non-edge pixel (The average filter filters non-edge data or homogenous data at col. 4, lines 27-30.); and

(b) altering a grayscale value of each non-edge pixel in proportion to averaged grayscale values of said pixels in a kernel of pixels surrounding each non-edge pixel (The average filter calculates (alters) a new value for the central pixel at col.

4, lines 42-45).

Regarding claim 28, Lee discloses the method of claim 23, said step of de-ringing non-edge pixel further comprising the step of de-ringing using at least some data previously calculated in said steps of mapping and sorting. The system of Lee produces an image without ringing at "OUTPUT IMAGE DATA" of figure 1. In order to output an image without ringing, the previous processes binary edge map generator 120 and filter selector 130 are operations that are previous to de-ringing.

Regarding claim 30, Lee discloses the method of claim 23, said step of edge sharpening further comprising the step of edge sharpening using at least some data previously calculated in said steps of mapping, sorting, and de-ringing. Lee states," From the image data filtered as above, a macroblock of the image data which passed through the signal adaptive filtering is composed again. Then, by repeating the above steps, the signal adaptive filtering on a frame image is achieved (step 550) (col. 5, lines 27-31)." Therefore, a frame is composed using multiple marcoblocks for each corresponding repetition of de-ringing.

Regarding claim 31, Lee discloses all the elements of claim 31 as addressed in claim 1 except for wherein said steps of edge sharpening and de-ringing may be performed substantially simultaneously (The output of figure 1 will produce a signal that that reduces ringing and enhances the quality of the image at col. 5, lines 34-37.) .

Regarding claim 32, Lee discloses the method of claim 31, said step of sorting further comprising the steps of:

(a) designating a group of pixels surrounding and including each non edge pixel being sorted (The filter selector checks whether or not a filtering window and a central pixel of the window is an edge area at col. 4, lines 1-20 and shown in figure 5, numerals 525 for edge area and 535 for the central pixel.);

(b) reading a grayscale value (The filter selector reads a binary edge map information to determine whether the map is referring to an edge or homogenous area at col. 4, lines 1-12.) of each pixel in said group of pixels;

(c) omitting said de-ringing and said edge sharpening (Fig. 5, num. 540 is a "NO FILTERING" operation) for said non edge pixel if said group of pixels includes at least a selected minimum number of edge pixels (If a central pixel is an edge pixel, then the window as a whole is not filtered. Lee states that if "any pixel" is determined to be an edge pixel within a window, then the whole window is an edge area that would include a mixture of "edge area" and non-edge pixels or "homogenous area" within the window at col. 4, lines 7-12); and

(d) de-ringing said non-edge pixel if said group of pixels does not include at least a selected minimum number of edge pixels (Lee states," If an edge point (or edge points) exists within the 3.times.3 filter window, but not at the central pixel, the weighted filter 150 performs the filtering operation using the weights shown in FIG. 3C (col. 4, lines 57-60).").

Claim 33 has been addressed in claims 13 and 18.

Claim 35 and 37 are similar to and addressed in claim 1.

Claim 36 is similar to and addressed in claim 2.

Claim 38 has been addressed in claim 1.

Claim 39 has been addressed in claim 1.

Regarding claim 40, Lee discloses the filter system of claim 37 further comprising a third post-processing module (Fig. 5, num. 540: "NO FILTERING") for post-processing a third category(fig. 5, num. 535: Edge information contained within a central pixel) of said plurality of pixels, wherein said third post-processing module is a non-filter.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 16-18,29 and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lee (US Patent 6,226,050 B1) and in view of Muka et al. (US Patent 5,774,599 A).

Regarding claim 16, Lee does not teach an unsharp masking for sharpening edges. Lee teaches a method of sharpening edges using a sum of weights within a kernel at col. 5, lines 1-26.

However, Muka et al., in the field of endeavor of image enhancement, teaches the remaining element of claim 16 of an unsharp masking method ("unsharp mask (USM) filter algorithm" at Muka et al., col. 7, lines 14,15), said unsharp masking method adding a high pass filtered image of the digital image to the digital image. Column 7 has a derivation of unsharp masking that includes adding a highpass image to the original image (first equation of the series of equations for the derivation can be algebraically manipulated).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to modify Lee's method of sharpening edges using a sum of weights with the teachings of Muka et al.'s USM filter algorithm, because Muka et al. teaches a "computationally efficient way of separating [an] image into frequency components (Muka et al., col. 7, lines 13,14)" that provides a "sharpness enhanced version of the image (Muka et al., col. 7, line 24,25)".

Regarding claim 17, Muka et al. teaches an unsharp masking module sharpening visual edges in said digital image by an edge sharpening factor k (The series of equations of column 7 uses a "boost" factor for an output image).

Regarding claim 18, Muka et al. teaches a high pass filtered image being obtained by subtracting a low pass filtered image of said digital image from a scaled version of said digital image (The last equation of the series of equations in the derivation of column 7 has an lowpass image with a boost factor subtracted from original image with a highboost factor.)

Claims 29 and 34 are similar to and addressed in claim 16.

Allowable Subject Matter

5. Claims12,15,19 and 20 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Lee et al. (US Patents 6,539,060 B1 and 6,259,823 B1 and 5,883,983 A) are pertinent as teaching a method of using an edge enhancement with a ringing.

Boliek et al. (US Patent 6,141,446 A) is pertinent as teaching a method of using adaptive filtering to preserve edges and reducing ringing artifacts at col. 40, lines 22-36.

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dennis Rosario-Vasquez whose telephone number is 703-305-5431. The examiner can normally be reached on 9-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Leo Boudreau can be reached on 703-305-4706. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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